Sliding secret. *The lid of this box slides through a hidden notch in the bottom key. Push the key in to lock the box.*

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Dovetail Puzzle Box

There Are No Locks to this Three-Key'd Box

by Mason Rapaport

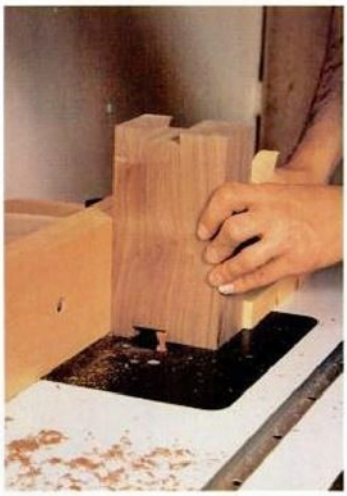
This box started as a mental woodworking project on a flight from New York to San Francisco. The puzzle (for me) was to come up with a design that wouldn't need a lot of measuring or fancy hardware, or require a lengthy glue-up. By the time my plane landed, I was ready to try my idea on some real wood.

Though I didn't make this puzzle box with the intent of selling it, it has become a furniture show favorite. It's amusing to watch people try to figure it out. Most people try to yank off the lid…just how hard they pull determines how soon I reveal the secret: a series of three engaging dovetail keys. You push the sliding bottom key to release the end keys and open the lid.

I made my box from straight-grained 8/4 walnut, gluing two pieces face-to-face to create the box blank. It can just as easily be made from a single piece of wood; or you can glue up contrasting woods for an entirely different look. Overall dimensions aren't critical for this project, as long as your blank is thick enough to accommodate the bottom key and still have room for an inner compartment.

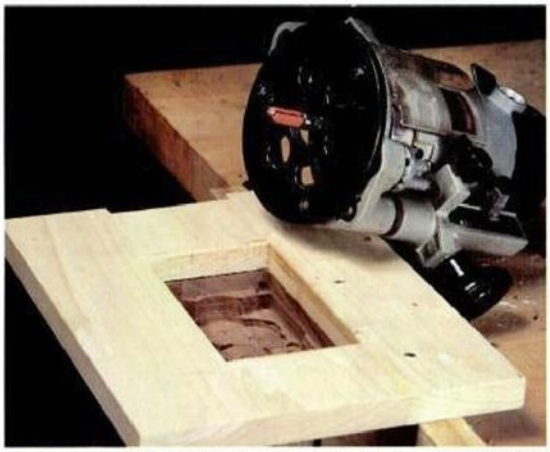
Dovetail Work

After squaring up the box blank and cutting it to length, I set up the router table to cut some dovetails. All of the dovetail work can be done with a dovetail bit set to a height of 7/16 in.



Routing the end keyways. *Guide the box blank against the fence and make a series of overlapping passes through the dovetail bit to complete each end keyway.*

Making the end keys. *A plywood guide strip, attached to the workpiece with double-faced tape, runs against the fence to guide the cut. Adjust the fence position to creep up on the finished width of the dovetailed part.*



Routing the hollow. *The bearing rides against the edge of the template to clean up the inside edges and bottom of the box.*

I used a 3/4-in., 14° bit, but you could use any dovetail bit on hand for this project.

Start by routing the two wide keyways on the ends of the box. I deliberately positioned these keyways slightly off center so that the lid would only match up if assembled the right way. Rout each end keyway about 2 in. wide, guiding the blank against the router table fence to make a series of overlapping cuts. (See top left photo.) If you're making a different size box, make sure that your end keyways will be wide enough for the bottom key to slide through with plenty of "meat" (at least 3/8 in.) left on the end keys.

The next step is to make the end keys—the pieces that fit in the keyways you just routed. I made both end keys (as well as the bottom key) from a length of walnut that I had planed to a thickness of 7/16 in.

Attach a length of 1/4-in. plywood to one face of the walnut with double-faced tape so that both pieces are flush along one long edge. Rip both plywood and workpiece about 1/4 in. wider than the widest part of your end keyways.

The objective is to shape each end key so it fits snugly in its keyway, yet is loose enough to slide in and out without binding. Without changing the height of the dovetail bit, I "nibbled" the workpiece to the correct fit by running the plywood against the fence and resetting the fence as necessary. (See center left photo.)

When you've got the right fit, cut the dovetail strip in two, making a pair of end keys at least 1/4 in. longer than the thickness of your box. Slide both end keys into their ways so that they're flush with the bottom of the box, and clamp them in place. Now adjust your router table fence to cut the keyway along the bottom of the box and through the center of both end keys. Keep the bit at its 7/16-in. height. I made several overlapping passes with different fence settings to complete this bottom keyway.

To make the bottom key, use the 7/16-in.-thick stock left over from making the two end keys. Cut the blank a couple of inches longer than needed. Make the bottom key with the same technique you used to make the end keys.

Lid and Lock

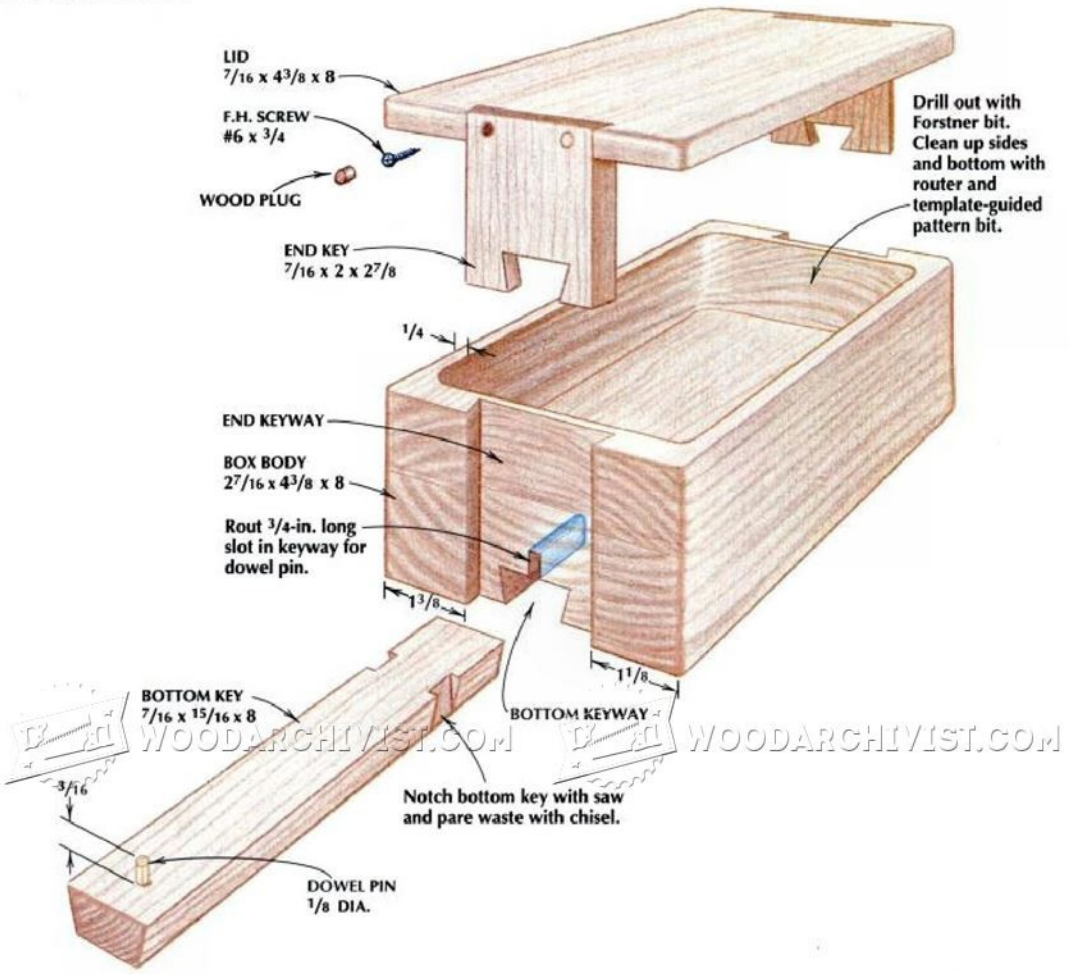
To make the lid, remove the end keys and bandsaw 1/2 in. off the top of the box blank. To smooth the rough-cut surfaces, I simply taped a sheet of 120-grit sandpaper to the tablesaw top and sanded both surfaces until they were seated smoothly against each other.

Now it's time to fasten the end keys to the lid. So that you don't smear glue into the end keyways and wind up welding the lid to the box, apply glue to the lid and insert the end keys from the bottom up. Insert the bottom key to ensure that everything lines up, then screw the end keys to the lid. Fill the counterbored holes with matching wood plugs. Now, remove the lid assembly and clean up any excess glue.

To make the slot for the dowel pin (see drawing), use a 3/16-in.-dia. straight bit in the router, adjusted to about 11/16 in. deep. Rout a 3/4-in.-long slot along the center of the bottom keyway. Next, install the pin in the bottom key. Drill a 1/8-in.-dia. by 1/4-in.-deep hole in the top of the key, 3/4 in. from one end, and glue in the 1/8-in.-dia. dowel pin. Trim the pin so that it stands about 3/16 in. proud of the key.

Now, notch the bottom key and complete the lock. To locate the position of the notch on the bottom key, fit the key into the bottom keyway and slide it in as far as it will go—

DOVETAIL BOX


LID
7/16 x 4 3/8 x 8
F.H. SCREW
#6 x 3/4
WOOD PLUG
END KEY
7/16 x 2 x 2 7/8
Drill out with Forstner bit. Clean up sides and bottom with router and template-guided pattern bit.
1/4
END KEYWAY
BOX BODY
2 7/16 x 4 3/8 x 8
Rout 3/4-in. long slot in keyway for dowel pin.
1 3/8
1 1/8
BOTTOM KEY
7/16 x 15/16 x 8
BOTTOM KEYWAY
3/16
Notch bottom key with saw and pare waste with chisel.
DOWEL PIN
1/8 DIA.

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until the dowel pin stops against the end of the slot. Now slide the lid down and use a knife to mark where the outside face and inside edge of the end key touch the bottom key. Notch the bottom key with a dovetail saw and use a chisel to pare away the waste. (See drawing, above.)

Check the locking action. If the mechanism works smoothly, lock the box and trim the end keys and bottom key flush. Soften all the edges of the box with a router and a 1/4-in. round-over bit.

Hollowing and Finishing

I used my drill press and a 1-in. Forstner bit to hog out most of the waste inside the box. Since the finished depth of my box is 1 3/8 in., I drilled to a depth of 1 1/4 in., then cleaned up the bottom and sides of the opening with a router and a pattern-cutting bit.

The easiest way to do this is to make a template guide for your pattern bit. I glued up my template from four pieces of scrap to form a rectangular opening the exact size of the box opening. Don't worry about square corners in your template; the pattern bit will automatically create radiused corners. I aligned the template's inner edges with those of the drilled opening and rode the top bearing of the bit against the template while the bit cut the identical pattern in the box. (See bottom photo, opposite page.) You can scrape or sand any remaining router marks from the bottom of the box.

Next, I sanded all the parts of my puzzle box with 400-grit stearated sandpaper, and then I switched to 0000 steel wool to bring up the luster of the wood.

To preserve the natural appearance of the walnut, I decided not to stain the box. I applied two coats of penetrating oil finish with a rag, and left the box to dry for two days. For added protection and a more uniform appearance, I followed the oil with three wiped-on coats of polyurethane thinned 50/50 with mineral spirits, allowing a full day for each coat to dry. ▲

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designs and builds furniture in Massachusetts. He build boxes mostly for the fun of it.